REMARKS

Claims 1-26 are pending in the present Application. With this Response, Applicants amended Claims 1, 22, and 24. Applicants also added claim 26. The amendments add no new matter and are fully supported by the specification.

Specification

The Office Action states:

> "Applicant(s) is(are) reminded of the proper content of an abstract of the disclosure.
>
> The abstract should not refer to purported merits (has high power supply ripple rejection ratio) or speculative applications of the invention and should not compare the invention with the prior art (the reference circuit has low speading among similarly manufactured systems. .. .). Correction is required."

In response, Applicants revised the Abstract. As a matter of clarification, Applicants note that the term "similarly manufactured systems" did not refer to the prior art, but refers to the spreading of operating parameters within a batch of the presently described circuit as a consequence of uneven manufacturing process, as explained in paragraph [0040]. References to purported merits have been removed.

Claim Rejections – 35 USC § 102

The Office Action rejected claims 1, 4-6, 8-12 and 17-25 under 35 U.S.C. §102(b) as being fully anticipated by Mercer (U.S. Patent 6,198,266). Claim 1 recites:

> "1. (Currently amended) A band-gap reference circuit, comprising:
>
> a core reference circuit, having a core output terminal;
>
> a voltage amplifier, having a single ended input stage, coupled to the core output terminal and having a voltage amplifier terminal;
>
> a transconductance amplifier, having a single ended input stage, coupled to the voltage amplifier terminal; and
>
> a shared voltage rail, coupled to the core reference circuit and the transconductance amplifier, wherein the shared voltage rail is an output voltage terminal."

The Office Action states:

> "As to claim 1;
>
> A band-gap reference circuit (see, e.g., figure 2(a), comprising: a core reference circuit (30), having a core output terminal; a voltage amplifier (Q3 and Q4 and 32), coupled to the core output terminal and having a voltage amplifier terminal; a transconductance amplifier (34), coupled to the voltage amplifier terminal; and a shared voltage rail (see, e.g., Figure 2(b) and Vin), coupled to the core reference circuit and the transconductance amplifier."

Applicants respectfully point out that the Mercer reference does not have the claim limitation:

"a voltage amplifier, having a single ended input stage."

Indeed, Mercer's voltage amplifier (Q3, Q4 and differential input stage 32) has a differential input stage. This is clearly seen in FIG. 2(a), where the input terminals of differential input stage 32 are labeled by +/- labels, and in FIG. 2(b), where these +/- input terminals of the differential input stage 32 are connected to transistors Q1 and Q4.

In contrast, Applicants' voltage amplifier has a single ended input stage, which does not utilize a differential amplifier. In some embodiments this single ended input stage can include transistor Q4. Applicants' specification explains the importance of this difference e.g. in paragraph [0040] as:

> "Differential amplifiers have offsets because of the mismatch of the parameters of their transistors, and hence increase spreading. Here "spreading" refers to the variation of the band-gap voltage of a batch of manufactured circuits."

Accordingly, the Mercer reference's voltage amplifier having a differential input stage is critically different from Applicants' voltage amplifier, which has a single ended input stage.

Further, the Mercer reference does not have:

"a transconductance amplifier, having a single ended input stage."

Indeed, the Mercer reference's transconductance amplifier (Output Transconductance Amplifier (OTA) 34) has a differential input stage. This is clearly seen in FIG. 2(a), where the input terminals of the Output Transconductance Amplifier 34 are labeled by +/- labels, and in FIG. 2(b), where these +/- input terminals of the Output Transconductance Amplifier 34 are connected to transistors Q5A and Q5B.

In contrast, Applicants' transconductance amplifier has a single ended input stage, which does not utilize a differential amplifier. In some embodiments, this single ended input stage can include transistor Q3. As cited above, Applicants' specification explains that this difference is important.

Accordingly, the Mercer reference's transconductance amplifier having a differential input stage is critically different from Applicants' transconductance amplifier, which has a single ended input stage.

Further, the Mercer reference does not have:

> "a shared voltage rail, coupled to the core reference circuit and the transconductance amplifier, wherein the shared voltage rail is an output voltage terminal."

Indeed, in the Mercer reference the Output Transconductance Amplifier 34 is connected to the input voltage terminal Vin. This is different from Applicants' circuit, where the transconductance amplifier is coupled to the shared voltage rail as shown in e.g. in FIGs. 1, 2, and 5. Since the shared voltage rail is an output voltage terminal as well, the transconductance amplifier is coupled to the output voltage instead of the input voltage.

An important aspect of this difference is that when the input, or supply, voltage fluctuates in the Mercer reference the transconductance amplifier will be influenced by these fluctuations, reducing the ripple rejection ratio. In contrast, in Applicants' circuit the transconductance amplifier is coupled to the output voltage, which exhibits much reduced fluctuations even when the input voltage fluctuates. Therefore, coupling the transconductance amplifier to the output voltage enhances the ripple rejection ratio considerably, in comparison to the Mercer reference.

For at least the above reasons, claim 1 has been shown to be allowable.

Claims 4-6, 8-12 and 17-21 and 26 depend from allowable claim 1, and are themselves allowable at least for this reason.

Method claims 22-25 were rejected as anticipated by Mercer. The Office Action states:

> "For method claims 22-25, note that under MPEP 2112.02, the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986). Therefore the previous rejections based on the apparatus will not be repeated."

In response, Applicants note that in relation to claim 1 it was demonstrated that the Mercer reference does not have several limitations of Applicants' device. In particular, the Mercer reference does not have:

> "a voltage amplifier, having a single ended input stage, ...;
>
> a transconductance amplifier, having a single ended input stage, ...; and
>
> a shared voltage rail, ..., wherein the shared voltage rail is an output voltage terminal."

Therefore, the rejection of method claims based on the anticipation of the corresponding device claims in the Office Action has been overcome. Therefore, claims 22-25 have been shown to be allowable at least for this reason.

Claim Rejections – 35 USC § 103

The Office Action rejected claims 13-16 and 23-25 under 35 U.S.C. § 103 as being unpatentable over Mercer (U.S. Patent 6,198,266).

In response, Applicants note that dependent claims 13-16 depend from allowable claim 1 and are therefore allowable at least for this reason. Dependent claim 23 depends from allowable claim 22 and dependent claim 25 depends from allowable claim 24. Therefore, claims 23 and 25 are allowable themselves at least for this reason.

CONCLUSION

Applicants respectfully request that the pending claims be allowed and the case passed to issue. Should the Examiner wish to discuss the Application, it is requested that the Examiner contact the undersigned at (415) 772-7434.

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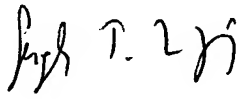
Respectfully submitted,

By: 

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